



Massachusetts Interfaith Power and Light Case Study *Trinity (Episcopal), Topsfield, MA*

In 2005, the reality of an aging boiler (45± years, oil converted to gas) and an equally old distribution, delivery and control system began to hit home. The need for improvement was reinforced by the costs of heating. Costs are typically a big problem at Houses Of Worship (HOWs). As an initial step 44 non-operable windows in the classroom wing were upgraded for significant improvements in thermal performance. Then original *pneumatic* thermostats were replaced throughout the building, followed by replacement of mixing valves in the boiler room.



But the rubber didn't hit the road until the "old" boiler failed, and the need for replacement and other system improvements was unavoidable. The old boiler (at left) was replaced with two



95±% efficient gas-fired condensing mode hydronic boilers, shown at right.



New controls and thermostats were installed. Heating zones were increased from 4 to 11. Domestic hot water (DHW) generation was converted to an in-direct fired storage tank using the high efficiency boilers. A computer-based Energy Management System (EMS) was incorporated for

precise heating delivery. This system enables monitoring and control from remote locations.



COST and CO₂ SAVINGS

Total 2012/13 heating season gas cost was \$6,710 compared to \$20,617 in 2005/6 before the new heating system was installed. This is a 67% savings of \$13,908, about 1/3 of which was due to lower cost/therm. Importantly, the heating system improvements **reduced carbon emissions** by about 79,000 lbs of CO₂, **a reduction of 53%!** The two heating seasons had virtually an identical *Heating Degree Day* total, so the savings (\$ and CO₂) reflect the reality of the system upgrade benefits. Importantly occupant comfort not only showed no diminution, but in fact was better given an improved match of heating and usage patterns.

HEATING — Utility Use & Cost						
<i>Trinity, Topsfield</i>						
Year	Month	\$s	Therms	\$/therm	Heating Degree Days	CO2 lbs
2005	October	\$522.41	286	\$1.83	248	3,346
	November	\$2,566.08	1,487	\$1.73	496	17,398
	December	\$4,338.67	2,545	\$1.70	922	29,777
2006	January	\$3,986.94	2,337	\$1.71	790	27,343
	February	\$4,091.84	2,662	\$1.54	859	31,145
	March	\$3,225.17	2,180	\$1.48	715	25,506
	April	\$1,886.62	1,275	\$1.48	372	14,918
TOTAL of 2005/6		\$20,617.73	12,772	\$1.61	4,402	149,432
2012	October	\$217.08	218	\$1.00	185	2,551
	November	\$857.75	771	\$1.11	577	9,021
	December	\$1,116.82	996	\$1.12	721	11,653
2013	January	\$1,660.82	1,489	\$1.12	913	17,421
	February	\$1,259.67	1,127	\$1.12	800	13,186
	March	\$964.08	860	\$1.12	733	10,062
	April	\$633.80	559	\$1.13	383	6,540
TOTAL of 2012/13		\$6,710.02	6,020	\$1.11	4,312	70,434
	<i>% of 2005/6</i>	<i>32.5%</i>	<i>47.1%</i>	<i>69.0%</i>	<i>98.0%</i>	<i>47.1%</i>

LESSONS LEARNED

A key lesson — *Don't Go It Alone!* Get help from MIP&L, other HOWs, and, for “big” changes such as at Trinity, get a *Professional Team* (Mechanical Engineer, Architect) under contract. Having 2 boilers means better efficiency, and the building is heated even if one fails. Get bids on the design package for the new system. Sit down and grill at least 2 bidders. The lessons you will learn and the financial benefits you will achieve will be significant. Keep your *Professional Team* involved throughout. Their wisdom and experience are worth every penny. This is especially true for the first year of use. Monitoring during the initial phase of use is really important. Getting valves, control wires, transformers and other system elements “right” is critical, and happens only in the monitoring of actual use. The remote *EMS* control enables ready adjustment (on- or off-site) of the day-by-day/week-by-week changes of room use. This keeps users happy and efficiency up. At the local human-interface level, *Keep It Simple*. Get simple but “smart” thermostats. Be sure that if the temperature setting is changed by a user, it reverts back to the programmed temperature and pattern. Keep track of the Utility Use and Cost (UU&C), every month. Report UU&C to decision-makers and to everybody in the congregation.

As with all we are taught at our House Of Worship, the lessons can and should be taken and put to practice at home, work, school, everywhere.

With thanks to Bruce Gaboriault of Trinity for his wisdom, observations and stewardship.

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